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ABSTRACT

This final report describes activities of the 3-year Activating Children Through Technology (ACTT) Outreach program housed in Macomb Projects in the College of Education at Western Illinois University, which attempted to integrate assistive technology into early childhood services for children, ages birth to 8, with disabilities. Major program goals include stimulating services, training and replication, assistance to states, and providing a product-development and information dissemination resource. The program is responsive to assistive technology services legislated by the Individuals with Disabilities Education Act and the Technology Related Assistance to Individuals with Disabilities Act. ACTT's developmentally based curriculum is intended to be integrated into existing early intervention curricula and provides computer activities to aid in problem solving, communication, social interaction, and development of autonomy and competency. It provides strategies for family participation and for integrating young children with disabilities into groups of predominantly nondisabled children. The 3-year project has trained personnel in replication sites and workshops in 27 states and has served 6,568 children. Project products include training modules, software programs which support curricular objectives, videotapes of current technology applications, and equipment modification schematics. (Contains 44 references.) (DB)

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Final Report

Early Education Program for Children with Disabilities
United States Department of Education
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ACTT Outreach Abstract

The primary purpose of ACTT (Activating Children Through Technology) Outreach, housed in Macomb Projects in the College of Education at Western Illinois University, is to integrate assistive technology[1] into early childhood services for children, ages birth to eight, with disabilities. Major goals focus on stimulating services, training and replication, assistance to states, and providing a product-development and information dissemination resource. Objectives include awareness activities; replication; product development, revision, and dissemination; training; consultation including cooperative work on a diagnostic team; assisting states; and local, regional and national cooperative activities.

ACTT provides services that are responsive to the federal emphasis on assistive technology services legislated by IDEA, its amendments, and the Technology Related Assistance to Individuals with Disabilities Act of 1988, P.L. 100-407. Requests for replication and training come from Part H and Part B state level personnel, state Assistive Technology projects, other state level agencies, regional agencies, and individual sites. During ACTT's past three years of Outreach work, over 2430 requests for technological services were received. We trained personnel in replication sites and workshops in 27 states. We have replication sites at different levels of experience in model adoption in 15 states.

A large number of children, families and staff have benefited directly and indirectly from ACTT Outreach activities. Three ACTT components are replicable, defined according to developmental level, chronological age, severity of disabilities, and most common service delivery strategy: 1) Birth to Three; 2) Three to Five; and 3) Severe Disabilities. Sixty-seven replication sites have been established in 15 different states and Canada, serving 6,568 children. ACTT has three continuation sites serving 79 children. Criteria for replication as well as criteria for determining the entry level of the site (from Level I to Level IV) have been established. ACTT also provides training through numerous workshop and conference presentations. Staff conduct presentations and workshops on-site as well as through the interactive satellite television capabilities housed at WIU.

ACTT Outreach trains trainers or direct service delivery staff depending on the size of the site. Trainees can be any of those identified in the law, including early childhood personnel, occupational or physical therapists, psychologists, communication specialists, other support personnel in early intervention programs, and parents. Training content is organized into eight modules. Sites send trainees to the ACTT site for one or more five day intensive training sessions depending upon the component being replicated and the site's level of computer expertise, or ACTT staff can travel to the site to do training. Trainee outcomes are measured according to technology competencies. Outreach staff provides consultation and follow-up services at the replication site. Sites collect data on children, parents, and staff.

ACTT staff have extensive experience in providing Outreach training as well as inservice and graduate-level coursework. University credit is available to participants of ACTT training sessions.

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[1] "Assistive technology" refers to those devices and applications which increase, maintain, or improve the functional capabilities of children with disabilities, including computers, alternative input and output, software, dedicated augmentative communication devices, and other aids. The term is used interchangeably with "technology" in ACTT.

Products have been developed or revised and disseminated. They include training modules for trainers to use, software programs which support curricular objectives, videotapes of current technology applications used by children, and equipment modification schematics. Existing products have been widely distributed. Products include **Building ACTTive Futures: ACTT's Curriculum Guide for Young Children and Technology**, a software catalog, a guide to peripheral use, a switch construction book, software, and training materials. From October 1989 through December 1993, over 1445 products were distributed. A twenty-page publication is distributed quarterly to sites and subscribers. A mailing list of over 3400 individuals and agencies is maintained.

Continued coordinated activities with other technology applications groups include hosting an annual ACTT Conference and cooperating with the National Cristina Foundation Local Focus pilot sites, the Illinois Assistive Technology Project, as well as Technology Projects in other states, and with national groups focusing on technology for people with disabilities and those who focus on young children with disabilities, since both need our services.

Project ACTT: Activating Children Through Technology
Final Report

Goals and Objectives of the Project

Technology applications, including switches, computer hardware and software, are no longer seen as frills or as unneeded components of early childhood programs by many parents, professionals, and other decision makers. Legislation and practice both acknowledge technology as an important aspect of services to young children with disabilities and their families. A body of research together with a wealth of qualitative anecdotal data related to technology use and young children has developed. Macomb Projects, in the College of Education at Western Illinois University (WIU), anticipating the growing effectiveness of technology, has been developing and demonstrating model programs and curricula, as well as training others to use technology applications with children with disabilities since 1981. Our focus is on children and families first, then on the technology tools and adaptations that can assist those children **do** things they have not been able to do -- for example, communicate, play with toys, interact with others, or draw.

When ACTT began in 1983, it was the first Handicapped Children's Early Education Program[1] demonstration project designed to use technology with children, ages birth to eight, with disabilities. It has been used successfully with over 6,568 children from birth to eight with mild to severe disabilities in 67 rural and urban adoption sites in 15 states and Canada.

Goals

The four major goals of ACTT Outreach focus on training and replication, product development, widespread dissemination and assistance to states. The goals include the following:

1. Stimulate services based on current technological innovations to children, ages birth to 8, with disabilities and their families.
2. Train personnel and family members to use technology applications and adaptations for children from birth to 8 with disabilities.
3. Assist states to include plans for use of technology with young children in their comprehensive delivery systems and in their plans for the Technology Related Assistance for Individuals with Disabilities Act[2], and to implement those plans.
4. Serve as a national resource in product development related to young children and technology and in disseminating information and delivery strategies.

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[1] HCEEP is now Early Education Program for Children with Disabilities or EEPCD

[2] P.L. 100-407 will be referred to as the Tech Act. The state Assistive Technology Projects will be referred to as Tech Projects

Objectives

The major objectives needed to accomplish the goals are listed below.

1.0 Accomplish awareness activities focusing on ACTT goals and contributions among selected target audiences including families, professionals across disciplines in early childhood intervention service agencies at local, regional, and state levels.

2.0 Stimulate high quality programs which integrate microcomputer technology in their intervention activities, provide training and technical assistance in the implementation of ACTT component replication in Level I, Level II, Level III, and Level IV sites. (Site levels are determined according to the degree of computer expertise the site has when they begin the program.)

3.0 Revise, develop, and disseminate ACTT products, including software, instructional materials, and video training tapes.

4.0 Provide training to parents, medical professionals, and early childhood personnel on topics related to the use of microcomputer technology with young children with disabilities.

5.0 Provide consultation to parents, medical professionals, public health, educators, and others related to early childhood on topics associated with the use of microcomputer technology and young children with disabilities and their families.

6.0 Serve as a resource to states as they develop and implement comprehensive delivery systems that include technology applications for young children with disabilities and as they respond to the Tech Act of 1988.

7.0 Cooperate and participate with other agencies in local, regional, and national activities related to microcomputer technology applications for young children with disabilities.

Theoretical or Conceptual Framework of the Project

Project ACTT effectively pairs emphasis on the importance of early intervention, as evidenced in the components of IDEA[3], with the importance of technology for individuals with disabilities demonstrated by IDEA and the Technology-Related Assistance for Individual with Disabilities Act of 1988. The ACTT model was based on the early work on computer-based contingency intervention of Brinker and Lewis (1982). Brinker continues his work with contingency intervention with infants in Chicago (personal communication, July, 1992), while Lewis and his associates (Sullivan & Lewis, 1988,1990) continue to work in Brunswick, NJ. We continue to extend and expand on our initial work, adding affordable new equipment and applications as they appear on the market.

Although the use of technology with young children with severe disabilities is a fairly new field of study (Behrmann,1989), the evidence indicates that intervening with computers produces changes in young children, even in infants (Abrahamsen, Romski, & Sevcik, 1989; Behrmann, 1984; Behrmann & Lahm,1983;

[3] Individuals with Disabilities Act - P.L. 102-119

Brinker,1984; Brinker & Lewis, 1982; Hutinger, 1987a; Hutinger, 1987b; Rosenberg & Robinson, 1985; Sullivan & Lewis, 1988, 1990). Young children with severe disabilities can use computer technology to produce interesting events (Butler, 1988; Rosenberg & Robinson, 1985; Robinson 1986a & 1986b); to manipulate contingencies (Butler, 1988; Brinker & Lewis, 1982; Sullivan & Lewis 1988,1990); to select activities or objects (Behrmann & Lahm, 1984a & 1984b; Locke & Mirenda, 1988); to interact socially (Podmore & Craig, 1989; Spiegel-McGill, Żippiroli, & Mistrett, 1989); to operate devices in their environment and to communicate (Herman & Herman, 1989; Hutinger, 1986a & 1986b; Meyers, 1984, 1990; Muhlstein & Croft, 1986; Shane & Anastasio, 1989; Spiegel-McGill et al. 1989); to develop a sense of control over their environment (Hutinger, in press); and to solve problems (Hutinger 1987b; Wright & Samaras, 1986).

The research suggests that the impact of computer use depends on the quality of the software, the attitude of the teachers, the physical and social arrangement, the accessibility of the machine, and on other events occurring in the classroom (Campbell & Fein, 1986; Shade & Watsen, 1990). Some of the results of the cited studies in Campbell and Fein's (1986) publication containing results of research related to computers and young children indicate that preschoolers can work cooperatively, with minimal instruction and supervision, with adequate adult support; that social interaction occurs frequently and positively; that children cooperate, helping and teaching one another; that children gain a sense of competence; and that they can use the keyboard even though they do not know the alphabet.

Further, there is evidence that younger children may benefit more from computer use than older children and that the computer may indeed help children learn things in new ways (Beeson & Williams, 1985; Kulik, 1986). In practice, we see evidence of this over and over. Results of a study carried out by the ACTT staff (Hutinger 1987b) indicated that children with mild disabilities and developmentally delays were able to use Instant LOGO to solve a variety of problems. Moreover, they retained those skills over a six-month time span during the summer before LOGO was started again in the classroom.

As educational tools, technology applications serve a variety of functions including simple experiences with immediate consequences such as touching a key or switch to see a bear eating ice cream and hear the "slurping" sound effects. For very young children, just beginning to find out about the world, the computer can be a tool to experience the consequences of their actions. With a change of applications, a computer can become the means for communication or for a complex problem solving activity. Unlike some traditional educational materials or approaches, single auditory or visual stimuli can be presented to elicit the most positive child response. Some software offers high quality graphics and immediate picture change without sound. Other programs focus on a variety of sounds which are appealing to young children. With the proper selection of software, a parent or an early interventionist can structure the computer's use to meet the needs of individual children.

A single computer can be used by individual children, two or three children, or as a group activity. When used with an additional speech synthesizer or internal speech, the computer provides a voice for communication or for language stimulation activities. Combined with graphics and animation, the added

component of speech output has been found to be an important contributor to enhance communication (Meyers, 1986, 1990; Shane & Anastasio, 1989). Technology applications can be integrated into a variety of early childhood curriculum content, including art, learning about people and places, music, language arts, math, daily activities, playing, and much more.

Sullivan and Lewis (1988), in summarizing their positive findings related to computer based contingency intervention, indicated that the preliminary evidence of positive outcome results of the Bayley and the child's state data are consistent with their hypothesized outcomes and that perhaps one of the major effects of the program was its effect on the perceptions and attitudes of parents toward their disabled children. In 1990 they affirmed this position, citing the mother of a Down syndrome infant who commented, "When they told me my baby would be retarded, I thought that he couldn't learn -- but he can learn. I see that he can learn. Knowing that has made a difference for me." (p. 374, 1990).

Section 12 of Part H of IDEA adds assistive technology devices and assistive technology services to clarify "early intervention services." (House Report 102-198, p. 12). The House Committee recognized the "critical importance of assistive technology in liberating many infants and toddlers with disabilities and their families from barriers encountered in all aspects of daily living, and in significantly enhancing learning and development." (ibid., pp. 12-13). The Committee noted that it was now aware of instances where assistive technology provision dramatically altered prospects for a child's future. Further, the Committee indicated that access to technology has resulted in the dropping of labels, opportunities to participate in integrated environments, increased children's confidence and ability, and changed perceptions of the child held by the family and others. The House Committee then added assistive technology services and devices to the definition of early intervention services to clarify that "these important supports are included as part of early intervention services for those infants and toddlers and their families who can benefit, and thus ensure their provision when appropriate." (ibid.)

Description of the Project

Description of the Model

The ACTT developmentally-based curriculum is easily integrated into an existing early intervention curriculum and emphasizes strategies to integrate technology into preschool curriculum content as part of ongoing learning activities. Adoption of the ACTT model provides computer activities to aid in problem solving, communication, social interaction, gaining a sense of autonomy, competency, and other important learning for young children. The ACTT model also provides tested strategies for family participation and for integrating children with disabilities into the types of settings in which young children without disabilities would participate.

Project ACTT is based on the philosophy that technology offers young children with disabilities a set of tools to assist them to achieve developmental goals. The ACTT model contains procedures for conducting technology activities with switches, battery-operated devices, computers and computer-related activities;

designing the technology learning environment; integrating computer activities into a variety of developmental domains and content areas; involving families in planning and interventions; and evaluating child progress and parent participation. The model reflects the fact that the **way** in which the technology is used is more important than what piece of equipment or software is actually being used. ACTT 's work in technology has focused on the Apple computers because their open architecture makes them easy to modify for use with young children. Procedures developed by the project can be used with the Apple IIGS and the older IIe and II+ versions, as well as with the newer Macintosh LC computers. One of our major strengths is our ability to adapt equipment for necessary applications and to produce the electronic devices and interfaces needed for obtaining alternative input for computers which can be used by children with disabilities.

ACTT has three major replicable components defined according to 1) the developmental level and chronological age of the child, 2) the severity of the child's disability, 3) and the most common service delivery strategy used with the age range. For example, home-based intervention is more often used with the birth to 3 population while the classroom is used for the 3-5 year olds. Although chronological age is an artificial factor in determining programs and IEPs for children with disabilities, we have chosen to base the components upon age because it is used as a criterion for placement in the commonly-used program organization in most states where birth to three programs are not mandated by law. When programs for children beginning at age three are mandated, they are found in public schools. The age range for children in the Severe Disabilities Component is birth to eight.

Each component includes developmental activities (or "curriculum"), procedures for hardware and peripheral use as well as adaptations, suggested software and its applications, necessary competencies for service delivery staff, management, procedures for working with families, and evaluation techniques. ACTT Curriculum components are defined and classified according the following:

1) Birth to Three;

2) Three to Five;

3) Severe Disabilities.

Similarities between procedures, equipment and activities are found in the Birth to Three Component and the Severe Disabilities Component.

Learning experiences for children. Use of technology as demonstrated by the model is highly effective in empowering children with disabilities or developmental delays when they learn to use technology applications. The ACTT curriculum is designed to: 1) foster the child's expectations of control over the environment; 2) provide an opportunity to participate in equalized play activity; 3) provide communication possibilities; and 4) enhance development of problem solving and general thinking skills, as well as related preschool curriculum skills. ACTT depends on a team approach in assessing and determining the most beneficial technology activities for individual children.

Families. Families participate in the ACTT model at three different levels, depending upon the level of involvement they wish to have. The three levels include 1) obtaining information and observing; 2) assisting

with the computer intervention; and 3) conducting the computer intervention. ACTT training modules contain procedures for involving families and providing training on the use of technology with their child. **Building ACTTive Futures** contains a section on parent participation at all three levels for each of the three components (Birth to Three, Three to Five, and Severe Disabilities).

Equipment children use in ACTT includes switches, battery-operated toys and devices such as tape recorders, together with computers, color monitors, and disk drives. Added to this are adaptive peripherals such as graphics tablets (pressure-sensitive devices that children can use to draw or use to give the computer "input" signals similar to pressing a key on the keyboard); touch tablets, such as a TouchWindow that attaches to the monitor permitting the child to draw or control a program by touching the screen with a finger; various electronic switches for "input" signals similar to pressing a key on the keyboard; robots that operate via the computer, "powered" by a software program; printers that print out "hard copy" (text and/or pictures in black and white or color printed on computer paper); and other devices that allow young children with disabilities to easily access the electronic potential of the computer. Although these peripherals are easy to operate, expertise and training are required to set the computers up so that children can use them.

Contrary to what some computer salespeople or ads suggest, most computer applications take a degree of technological sophistication to put together that beginners do not have. Helping our site staff and our trainees learn to set up computer equipment, connect and operate peripherals, troubleshoot when something does not work, and to know when they need to call in expert help, is one of ACTT's secondary purposes.

The ACTT training modules, used for both families and professional staff, contain information on how to use equipment and peripherals, make adaptations, and design integrated curriculum applications. Our own curriculum activities in **Building ACTTive Futures: ACTT's Curriculum Guide to Young Children and Technology** are designed to encourage communication, cooperation and other social interaction among children and the people in their environment. This curriculum guide is not an electronic workbook approach. Children are not exposed to activities and materials that are developmentally inappropriate, nor are they forced to watch little objects moving around the screen. ACTT's approach stresses the need to let children explore and manipulate the variety of inputs and outputs the computer allows and to give them an opportunity to feel and demonstrate a sense of control over their environment.

Description of Sites and Levels

A list of agencies we serve, together with their resources and the numbers of children they serve, is included in Table 1. Sixty-seven ACTT sites have been established in 15 states and Canada. In addition, we have three continuation sites.

A measure of interest in participating in ACTT is the amount of financial support and resources agencies provide for replication and training. Agencies pay expenses for their staff to travel to Macomb for a week of ACTT training. In most instances, they also pay for ACTT staff to travel to the replication sites for follow-up. Many agencies pay for ACTT staff to travel to their site to provide two-day awareness and hands-on

Table 1: ACTT Outreach Sites According to Levels of Involvement

ACTT Outreach Sites According to Levels of Involvement	# Children Served	# Staff
LEVEL I		
Bussey Center for Early Childhood Education - Springfield, Michigan	600	34
CO-TEACH - Missoula, Montana	9	9
Early Intervention Services - Peoria, Illinois	83	12
Ford Iroquois Special Education - Watseka, Illinois	51	19
Hudspeth Center - Whitfield, Mississippi	51	20
Oakland Schools Speech and Hearing Clinic - Waterford, Michigan	118	16
Shawnee Hills - Charleston, West Virginia	150	6
Thomas Jefferson School - Peoria, Illinois	65	13
LEVEL II		
Adams County 0-3 Program - Quincy, Illinois	65	8
Brown School - Morton, Illinois	120	20
Casper Child Development Center - Casper, Wyoming	155	15
Children's Hospital of New Jersey - Newark, New Jersey*	50	11
Children's Seashore House - Atlantic City, New Jersey*7		
Dallas High School - Dallas City, Illinois	9	2
Davenport Community School - New Liberty, Iowa	66	15
Davis Developmental Center - Chicago, Illinois	98	17
Developmental Services Center - Champaign, Illinois	80	16
Douglas Elementary - Princeton, Illlinois	20	2
Easter Seal Rehabilitation Center, Columbus, Ohio	42	19
El Valor Corporation - Chicago, Illinois	256	17
Fulton County Rehabilitation Center - Canton, Illinois	28	4
Harlem School District #122 - Love Park, Illinois	60	6
LaPaz Child Development Center - Chicago, Illinois	115	22
Nevada County Infant Program - Grass Valley, California	31	9
Pathway School - Jacksonville, Illinois	25	8
Santa Clara Office of Education - Santa Clara, California	160	26
Smouse School - Des Moines, Iowa	36	7
Westmer Elementary School - New Boston, Illinois	16	28
LEVEL III		
Bona Vista Programs - Kokomo, Indiana	120	20
Children's Seashore House - Berlin, New Jersey*	75	9
Department of Health - Wahiawa, Hawaii*	39	11
Easter Seal Society of HI/Kauai Service Center - Lihue, Kauai, Hawaii*	93	4
Easter Seal Society, ICDP-Hilo - Hilo, Hawaii*	45	5
Education Service Center, Region IV - Huntsville, Texas**	400	62
Galesburg Early Childhood Education - Galesburg, Illinois	23	3
Hopewell Special Education Regional Resource Center - Hillsboro, Ohio**	200	23
Horizons Rehabilitation Services - DeKalb, Illinois	50	16
Kapiloani Medical Center for Women and Children - Honolulu, Hawaii*	115	22
Kona Infant Development Program - Kaulakekua, Hawaii*	30	5
Lanakila Infant Program - Honolulu, Hawaii*	60	5
Leeward Early Intervention Program - Pearl City, Hawaii*	30	5
Macon/Piatt Special Education District - Decatur, Illinois**	250	65
Oquawka Grade School - Oquawka, Illinois	9	2
Parent-Child Development Center - Waianae, Hawaii*	40	9
Project CHILD - Trenton, New Jersey*	30	5
Society for Crippled Children and Adults of Maui - Wailuku, Maui, Hawaii*	200	1

*Represents a State Level Agency commitment.
**Represents a Regional commitment.

Table 1: ACTT Outreach Sites According to Levels of Involvement (continued)

ACTT Outreach Sites According to Levels of Involvement	# Children Served	# Staff
LEVEL III (continued)		
Sultan Easter Seal School - Honolulu, Hawaii*	56	14
Town Day Care Centre - Nova Scotia, Canada	114	16
United Cerebral Palsy Development Center - Honolulu, Hawaii*	20	10
William M. BeDell Achievement and Resource Center - Wood River, Illinois	90	44
Windward Infant Development Program - Kaneohe, Hawaii*	50	6
LEVEL IV		
BOCES II Special Ed Microcomputer Resource Center - Centereach, New York**	275	35
Bushnell-Prairie City Community Unit District #170 - Bushnell, Illinois	14	2
Early Intervention Programs - Wall, New Jersey*	260	5
Early-On - West Frankfurt, Illinois	45	5
Education Service Center, Region II - Corpus Christi, Texas**	58	11
Education Service Center, Region X - Richardson, Texas**	250	47
Habilitative Systems, Inc. - Chicago, Illinois	Variable	20
Hancock Central Community Unit District #338 - Ferris, Illinois	7	2
LAUREL Regional Program - Lynchburg, Virginia**	70	32
Quincy School for the Handicapped - Quincy, Illinois	15	3
Signal Centers - Chatanooga, Tennessee**	130	5
Society for Manitobans with Disabilities, Inc. - Winnipeg, Canada**	150	63
Warren Achievement Center 0-3 Program - Monmouth, Illinois**	225	25
CONTINUATION SITES		
Community Unit School District #180 - Colchester, Illinois	20	2
McDonough County Rehabilitation Center 0-3 Program - Macomb, Illinois	40	5
West Central Illinois Special Education Cooperative - Macomb, Illinois**	19	12

workshops for an entire staff. A variety of sources are used to fund ACTT replication sites, including federal and state grants and private foundations. In the past 12 months, various agencies have contributed over $23,876 in travel expenses for ACTT training.

Replication sites are classified according to their level of existing computer experience and skill and the number of personnel in their agency who are involved in ACTT replication. Sites with 10 or fewer staff members can send their entire staff for training or two persons to be trained as trainers who can then go back and train the remainder of the staff. ACTT training modules, instructional videotapes developed by the Microcomputer Applications Special Project, and a multimedia product developed by Project TTAP (Technology Team Assessment Process) are used by site trainers to facilitate training other staff members. Sites with more than 10 personnel can send one person for each five staff members to be trained as a trainer. Since learning to use a computer is frequently an anxiety-producing experience for service delivery staff, we spend differing amounts of time training sites, depending on prior computer experience. The ACTT competencies are used to determine entry and exit levels for sites.

Although more and more states offer beginning training on computer use to educational personnel, that training is not necessarily available to individuals who work outside the public schools. Furthermore, states are at varying levels of sophistication in their ability to offer initial training. Because of the number of requests we have for awareness and beginning training, as well as our contacts with others in the field who reported the need, we continue to include Level I training and will do so until beginning training is widely available.

Level I sites are those that have had little or no previous computer training or experience. They receive initial training on computer use either through ACTT or through their own state or local resources. Level I sites systematically begin to integrate computer activities into their existing curriculum and begin data collection. If needed, ACTT staff provide additional training and follow-up until it is determined that adequate computer skills have been acquired by staff to begin Level II training.

Level II sites are those whose staff have acquired or demonstrated basic computer skills. These sites receive initial training on the ACTT curriculum. After completion of initial training, sites begin implementation of the ACTT curriculum and data collection. ACTT staff provide follow-up to determine what additional competencies will be required to allow full implementation of the curriculum.

Level III sites are those that have received the necessary training to fully implement the ACTT curriculum. These sites keep child data based on curriculum goals and objectives. ACTT staff provide assistance in data collection and analysis procedures. Additionally, Project staff provide follow-up support on curriculum training and determine if the agency requires specific specialized training so that goals and objectives can be attained.

Level IV sites are those that have completed all training and have fully implemented the ACTT curriculum. These sites use adequate procedures for data collection and evaluation. Additionally, they develop and incorporate their own activities into the existing curriculum. Project staff provide follow-up and specialized training as determined and requested by the agency. Level IV sites also make presentations to interested groups or organizations, assist in dissemination activities in their region and are capable of providing initial training on computer use and the ACTT curriculum. Level IV sites have the option of being groomed to serve as resources on technology for early intervention professionals in their region or state.

Conditions for site replication. Sites chosen to replicate ACTT must meet the following requirements: 1) serve children with disabilities and/or high risk children from birth to 8 or some part of that age range; 2) have computers and resources to purchase software and peripherals; 3) purchase ACTT materials at reduced costs for use in the components they are replicating; 4) send representatives or their entire staff to Macomb for training; 5) participate in follow-up activities as needed at the agency's expense; 6) provide feedback on, and additions to, the ACTT curriculum; 7) collect data on child progress, family participation, and staff competencies and share it with the Outreach staff; 8) field test new materials and suggest new activities, adaptations, and procedures. Replication sites sign an agreement with ACTT when they are accepted as sites. Acceptance is based on ACTT staff's assessment of site needs and commitment to computer intervention, the order in which the request is received, and the agency's ability to meet the above requirements.

Site evaluation. The site monitoring plan includes follow-up visits and consultation involving observation, assessment of model components, child performance, parent skills and attitudes, staff skills and effectiveness, as well as their satisfaction with Outreach services. Strategies for follow-up include transfer of information by modem and videotapes of site intervention activities sent to Macomb for critique. Site monitoring procedures are used to determine the site's entrance into a new level and provide valuable information for planning future monitoring procedures.

ACTT services to sites. ACTT Outreach provides training, consultation, technical support including trouble shooting, critique of videotapes, analysis of data, and materials at cost to the replication sites. Staff maintain communication through telephone and electronic mail with sites who have access to SpecialNet (an electronic bulletin board) which can be used for instant information transfer. We provide resource information to sites and updates on new products and applications through **ACTTion News**, a 20 page publication distributed quarterly.

Dissemination Activities

Target audiences for ACTT training and replication are those cited in the law, including families, parent organizations, state agencies (including education, developmental disabilities, rehabilitation services, public health, and others), early intervention committees and councils, public and private agencies that house early intervention services, public schools, special education cooperatives, colleges of medicine, public and private universities and commercial vendors. We have an extensive mailing list, containing the names and addresses of more than 3000 people and agencies, that is updated as we make new contacts.

We advertise and distribute our products from the base established by the Macomb Projects. We use direct mailings, present at national and regional conferences, write articles about aspects of the model and the results of their use, and make personal contacts with state personnel and agency personnel. We produce training videotapes and have the facilities to engage in video production. Beyond this, however, we can use a satellite network, centered at WIU, for training and dissemination purposes. The WIU/ISBE Satellite Educational Network permits one way video and two-way audio. We have produced a 90-minute technology overview show via satellite, an ACTT I Conference Highlights show, and a 90-minute program on funding technology for young children with disabilities, in cooperation with the Illinois Assistive Technology Project. After producing a satellite television show, the videotapes of the show can be distributed to those who did not watch it or who wish to use it themselves.

For the past three years, we have held a technology conference at Macomb in the spring. This conference provides a way for us to disseminate information at the awareness, knowledge, and skills level. Sessions cover a variety of topics related to assistive technology use, and most presentations are given by Project ACTT and Macomb Projects' staff, although we have accepted presentations by others whose philosophy about technology use for young children with disabilities matches our own. The conference lasts two days, and allows people from across the country (attendees have come from Arizona, Illinois, Indiana, Iowa,

Michigan, Minnesota, Montana, South Dakota, Wisconsin, and Canada) an opportunity to share experiences, network, and learn from each other.

Our dissemination strategies tend to produce the highest benefits for the Project, but not the highest costs. Much of the advertising for ACTT is word-of-mouth from satisfied trainees. We continue to upgrade our awareness materials and dissemination strategies.

We are experienced in nationally disseminating materials related to ACTT. Tables 2 and 3 provide evidence of our successful dissemination efforts.

Training Activities

Format. ACTT Outreach training strategies are based on principles related to inservice (Bailey, 1989; Bents & Howey, 1981; Glickman, 1985; Guskey, 1986; Mohlman, 1982; Wolfe, 1990) and adult learning (Knowles, 1978, 1980). Bringing about change is a slow and difficult process that incorporates follow-up and continuing support (Bailey, 1989; Jones & Lowe, 1990). The assumptions that adult learners want to be able to use what they learn in the immediate future, that they bring a wealth of experience to the learning process, together with their need to be involved in the planning, guide our training philosophy. Training for replication sites, parent groups, state agencies, and broader target audiences uses these principles.

Since many adults are fearful of computers and the accompanying technology, ACTT uses tested, successful strategies, providing ample time for trainees who are new computer users to have hands-on time in a non-threatening situation so they can become comfortable with the equipment before they use it with children. This is an essential condition. The training pattern includes the following steps: 1) assess needs; 2) train; 3) apply what has been learned in the trainee's site; 4) consult with ACTT staff; 5) participate in follow-up activities; 6) participate in a follow-up site visit by ACTT staff. Further training repeats the cycle.

The bulk of the training is done at the ACTT site in Macomb because we have access to a wide variety of equipment, necessary peripherals, software, and other resources. Traveling with enough equipment to train a group of 10 people is difficult for staff and hard on expensive equipment. Most sites do not have enough hardware or adaptive peripherals to train a group of people. We have used this strategy successfully to train sites for the past six years.

Procedures. The needs, computer skills, and level of sophistication of the replication site are assessed. ACTT staff and site staff together then determine whether the site requires Level I training or should begin with Level II training. If Level I training is needed, we recommend that site staff attend a three-day Level I training session at the ACTT site or receive this initial training through their state or local resources. Upon completion of Level I training, trainees spend a period of one to two months applying ACTT methods and procedures at their home site. At the end of this period, ACTT staff conducts a follow-up assessment of the site's attainment of Level I competencies. Together ACTT staff and site staff then determine whether additional training and/or an extended application period is required or if Level II training should be scheduled.

Table 2: Summary of ACTT Product Dissemination October 1, 1989 - December 31, 1992

ACTT Product Dissemination October 1, 1989 - December 31, 1992 Project ACTT Products	Number Distributed				
	Illinois	National	Canada	International*	Total
Peek & Speak	6	39	2		47
Switch 'N See	14	98	13	4	129
EasyCom	2	21	2		25
Master Blaster	9	98	5	2	114
Mice	1	2	2		5
Software You Can Use in Early Childhood	11	38	5	3	57
Good Leads for Software Needs	25	28	3	2	58
How To's for Apple II's	4	60	5	2	71
A Switch To Turn Kids On	2	110	4	2	118
ACTT Starter Kit		23	3	1	27
ACTT Curriculum	4	41	2	1	48
Building ACTTive Futures	9	81	10	5	105
Simple Switch Activities	4	22	3	2	31
Kid-Kat		14	2	1	17
ACTTion News Subscriptions	163	354	70	6	593
Total	254	1029	131	31	1445

*Saipan, Greece, Australia & New Zealand

Table 3: Summary of ACTT Services from October 1, 1989 - September 30, 1992

	International	National	Other States	Illinois	Total
Presentations	8	18	7	30	63
Persons attending	785	673	330	1001	2,789
Children served	11,775	9,668	4,295	14,645	40,383
Workshops	1	6	17	14	38
Persons attending	45	90	297	141	573
Children served	675	1,350	4,478	1,895	8,398
Replication Site Training	1		22	11	34
Persons attending	1		84	68	152
Children served	114		2,813	550	3,477
Printed Information					
Publicity/News releases	2	9	6	18	35
Products Distributed	149	942		298	1,389

Sites that have completed Level I training, or sites that have already acquired necessary computer skills and sophistication, schedule and complete a two to five day Level II training session. Trainees then return to their home site to begin program implementation. The site applies ACTT methods and procedures and takes part in follow-up activities for a two to four month period determined by need. After an appropriate implementation period, ACTT staff make an on-site follow-up visit as needed. This visit assesses attainment of competencies and program status. Videotapes of the site may be used to substitute for a visit. ACTT staff and site staff then determine whether or not additional training is required. If more training is required, arrangements are made and ACTT staff provide the necessary training. This cycle of training followed by an application period continues according to site needs. Follow-up is continued until all Level II competencies have been attained.

Sites which have attained Level III status continue to participate in follow-up activities, including on-site follow-up, to determine whether or not specialized training is required to ensure attainment of program goals and objectives. Project staff also assist the site, if necessary, in establishing systematic procedures for data collection and analysis. Upon attainment of all Level III competencies, sites achieve Level IV status.

Level IV sites have fully completed project replication. These sites continue to supply the ACTT office with project impact and effectiveness data. Follow-up for Level IV sites is provided as requested by the replication site. Level IV sites are expected to provide Level I training for other groups or agencies within their

region although this usually requires further training. However, this system allows ACTT staff to concentrate training efforts on Level II and Level III replication sites.

Training competencies. A set of computer competencies to be gained by staff and families alike provide the basis for ongoing training. Competencies are stated in behavioral terms and have been tested in replication sites, preservice coursework, inservice for early intervention staff, and in our work with families. A summary and analysis of the competencies acquired by trainees provides us with an evaluation tool. The competencies needed for ACTT modules have been tested and are routinely used in our training.

Content. A series of training modules which include written materials and videotapes, together with "hands-on" computer experiences form the basis for the content of training events. The eight ACTT training modules include the following topics: Computer Training, Birth to Three Curriculum Applications, Preschool Curriculum Applications, Severe Disabilities Curriculum Applications, Switch Construction and Applications, Program Evaluation, Tool Use, and Training Trainers. These modules reflect the knowledge and skills needed to replicate ACTT components. They are updated as technology changes.

Content from ACTT formed the basis for a set of videotape modules designed to teach personnel and families to use microcomputer applications with children with special needs. The Microcomputer Applications Training Modules, developed by Macomb Projects as a Special Project from the Division of Personnel Preparation, United States Department of Education, include a series of three sets of videotapes and written materials: 1) applications for young children with severe disabilities; 2) applications for preschool children with disabilities; and 3) applications for children from birth to 3 with disabilities. ACTT procedures also formed the basis for our Technology Team Assessment Process (TTAP) and accompanying multimedia presentation **Tap into TTAP**[4] which can be used in ACTT training.

Families. The ACTT model provides for working directly with families at three different levels: acquiring awareness, assisting with intervention, and conducting intervention. Content related to working with families includes providing staff with materials and strategies to demonstrate the need for technology and the benefits of computers. It also includes strategies for training parents and family members to use computer applications with the children and for their own purposes. The ACTT competencies are used when training family members. Activities, organizational plans, and lists of equipment to conduct parent workshops are also included in the ACTT training materials.

Problems and Solutions

Although ACTT experienced few methodological or logistical problems during its 1989 - 1992 funding period, problems related to a negative image of technology harbored by a segment of early intervention personnel continue to be an ongoing barrier which is beyond our control. The major factors related to this

[4]**Tap into TTAP** is a training package which allows individuals to learn at their own pace using a Macintosh computer running a CD-ROM and laserdisc. It contains documents and measures which can be printed out during the learning session, procedures for before, during, and after an assessment, and a competency check. The new revision will also include child assessment software, **Something's Fishy.**

negative perception and associated problems are human variables, process variables, and resource variables. However, the human variable is basic to all the others. As a result, assistive technology is often seen as a threat.

Although technology applications, including computer hardware and software, and services for young children are now recognized in federal laws (IDEA and the Tech Act), policy and model practice as important and effective elements of services for young children with disabilities, in reality technology is not widely accepted as an important component of early intervention. Elements of the human factor result in early intervention personnel's pervasive fear of technology, distrust in its benefits, and doubt of its need.

The major problems in obtaining greater acceptance for assistive technology applications are related to staff fear and distrust of hardware, software, and potential outcomes. Other problems include lack of trained personnel and of training opportunities, particularly as children are transitioned into other programs and as staff changes; discrepancies between what families want for the child (i.e., technology applications) and what early childhood personnel believe is appropriate; hurdles in securing funding for updated equipment and software; maintenance of equipment; criticism of the capabilities of early software; and limited continuing support for integrating technology applications into early childhood experiences. Moreover, if personnel do not use developmentally appropriate activities, any technology application is doomed to failure.

While the fear and distrust of technology interferes with its successful integration into early childhood programs, we find that adequate administrative support for equipment, training and follow-up training alleviates a portion of the obstacle. When a Part H state coordinator decides to replicate ACTT, supporting training, follow-up training, and data collection in sites, much of the fear and distrust is replaced by competent staff. Hawaii took this approach in its Part H activities several years ago. Those sites continue to function effectively.

Hands-on, non-threatening instructional environments also alleviate fear and distrust. Ample opportunity to try things out in meaningful ways change participants' attitudes about technology. We emphasize the use of adult-productivity computer functions (word processing, data bases, graphic programs, record keeping software), showing participants ways they can use the computer themselves to make their lives easier. Individuals who use computers themselves are far more likely to use technology applications with young children.

As staff changes, technology training must continue. If training occurred on a broad basis with many people trained in a site, the effects of a single individual leaving are not devastating. But if only one individual in a site uses technology, then leaves, the entire program comes to a halt. Opportunities for ongoing training activities are needed. We developed a variety of follow-up procedures and modules which can be used to train new staff. We also developed an inservice model, Technology Inservice Project (TIP), based on ACTT procedures.

The availability of a technology consultant nearby in a site enhances the maintenance of equipment as well as the addition of new equipment and software. Someone who can troubleshoot problems quickly provides

needed support to early childhood staff and families. Our sites are encouraged to move in this direction. One site in Chattanooga has gone on to become a technology resource center, offering services to others.

The emphasis on parental participation and decision making emphasized by IDEA should have a positive effect on technology obstacles. Our data show that parents are often far more interested in their children receiving the benefits of technology than are intervention personnel. Parents then can insist that service delivery programs provide technology applications and services. Parents and staff can take training at the same time. Often parents can assist staff members in learning to use a particular device.

Funding technology devices for specific children must be done on a case by case basis. As more and more information on funding is available, we find that securing resources is not quite as much of a problem as we faced three years ago. We sponsored an hour and a half interactive satellite video show in 1992 on funding technology for young children in conjunction with the Illinois Assistive Technology Project. We also developed a short publication on funding for use by families and programs. Our work in funding emphasizes the initial discrimination between the purposes for technology -- is it medical or educational?

Criticism based on the developmental appropriateness of available software as well as the limited potential of many software programs, is well deserved. The early software, with the exception of LOGO, was based primarily on what adult computer programmers thought young children should use -- ABC's, numbers, and adult-directed drill and practice. New software for faster computers is far better. Software on CD-ROM launched from a Macintosh platform provides a range of interactive, appropriate experiences. However, showing people how to use the old software in new ways sometimes results in an unexpected serendipity!

The legislative requirement to place children with disabilities in settings frequented by others without disabilities carries with it the need to provide children the support to function in settings with their peers. One way to help children with disabilities operate in mainstreamed settings is to provide technology applications for them to use. Site visits to successful programs or viewing videotapes of children using effective applications often sway personnel towards more positive perceptions. For example, when a youngster with cerebral palsy who cannot hold a crayon is able to make a scribble or a recognizable image on a computer screen, using a switch and a graphics program, then print the image onto paper with a color printer, that child has a tool to assist her in a classroom where other children also draw on paper with paint, crayons, and markers. Some children **need** technology applications, particularly those with moderate to severe disabilities.

We often hear a technology-naive teacher, when talking about children with disabilities, say "These children don't need computers, they need the basics." However, for many children with disabilities, technology applications **are** the basics. Further, children with disabilities must have access to the benefits of technology that children without disabilities enjoy. Technology can serve as an equalizer for a child with disabilities in many situations so that s/he can function in the same settings and similar activities that typical young children do, including playing games, drawing, making music, or moving a robot across the floor with a computer, appropriate peripherals, and software. Technology activities can assist in all these experiences. Demonstating

or showing videotape of children engaged in various activities is likely to positively impact an administrator's or staff member's decision about computer and assistive technology use.

If assistive technology intervention is to be successful for any child with disabilities, information and training must be spread more widely to early intervention personnel, therapists, administrators, and preservice personnel. ACTT meets this need through its training and services.

Evaluation Findings

ACTT focuses the major portion of its evaluation efforts on directly observable behaviors in children as opposed to internal behavior inferred from test scores (such as intelligence). The bulk of our data is qualitative in nature. From the beginning our effort has been on showing that young children with disabilities can independently use the computer as a tool to control or access aspects of their environment. We are also interested in the amount of social behavior children display while using computers as well as their ability to use the computer in "equalized play" situation with children without disabilities as well as children with disabilities. Another interest which approaches inferred effects is the use of computers to increase problem solving behavior.

While further study needs to be done on the effects of technology, our evaluation studies, extensive experience and videotape library of children with disabilities using technology over time in addition to the behavior coding already completed, point towards positive effects in these areas. We **do** have data that show computer-using preschool children are significantly more skilled in computer knowledge and use ($p<.01$) than those who have not used computers. The ACTT intervention has made a positive difference among children.

Since our efforts have been in an area previously unavailable for research because the technology did not exist, and since there was originally a question of whether or not young children with disabilities could even use the equipment, we have collected a great deal of exploratory descriptive data which will be of great value to the field and has already served as a base for a research study[5] we are currently conducting for the Technology, Educational Media, and Materials for Individuals with Disabilities Program on the effectiveness of technology . The information we have collected provides a base to ask further questions about the effects of computer use on young children with disabilities.

Sources of Data

Data sources for model impact include direct observation of children with accompanying written records, videotapes, records of activities and use of materials, interviews and surveys of children, families and staff. Data sources for Outreach impact include questionnaires related to training, competencies

[5]Effective Use of Technology to Meet Educational Goals of Children with Disabilities. PR #H180R10020

attained, observation, and model impact data for sites. In addition, we have conducted small scale studies on selected ACTT interventions.

Child Progress

While computer software may provide some tutorial functions so that young children with disabilities can learn concepts, we believe that because of the developmental level of the children in early intervention programs, concrete and manipulative materials must be provided. Further, our evidence indicates that children under the age of three are most likely to need pre-computer experiences with switches, toys, and other environmental devices such as tape recorders and mobiles and that some children certainly do not need to use computers but need many more direct experiences with objects in the world around them. However, when children cannot access the world because of their disabilities, technology applications provide them an opportunity to do so. Our data indicate that children with multiple disabilities can do many more things when they have access to a computer than when they are expected to use traditional early childhood materials. Computers provide the analog to help these children do some things that "typical" children do (for example, play games, communicate with voice synthesizers, use word processing).

Birth to Three Services

Many children in the Birth to Three component have been videotaped at regular intervals, with some children having each session videotaped, since the beginning of their involvement with ACTT. Some of these videotapes have been coded for existing behaviors. Samples of coding on two children indicate that desirable behaviors increase over time. For example, a 2-year-6-month-old, severely delayed in several developmental domains increased both vocalizations and use of words from approximately 5% to 21% while less prompting was needed, a finding that the Child Development Computer Specialist (CDCS) felt indicated an increase in the child's intent to activate the program on her own. Another youngster with severe disabilities, aged 1 year 9 months, activated the head switch 16% of the time in April and increased to 47% in August. This same child also turned her face toward the toy she activated 23% of the time in August, but not at all when the project started. The CDCS and parent both felt that the increase in activation of the mercury headband switch to start a toy and the increase in turning toward the stimulus was positive. Since this child has no physical ability to interact with toys and usually shows no interest in the environment, this data seems to indicate an increasing awareness and desire to control her environment. A blind child under three for whom coding has not yet been completed, has shown consistent progress with the switch and a tape recorder activity. He will consistently use a switch to activate a tape recorder with a "Crazy Sounds" tape, and continue to press the switch and enjoy the sounds for several minutes without adult prompting. Prior to this activity, the child tended not to attempt to exert efforts to control any aspect of the environment.

Preschool Services

Our data shows that the population in preschool classrooms for children with disabilities, a group displaying mild to moderate disabilities, are likely to demonstrate positive behaviors such as attention spans that increase from two or three minutes to 15 minutes or longer when using LOGO (a graphic programming language sometimes referred to as a tutee function of the computer where the child "teaches" the computer to perform an operation).

Children in the preschool classrooms have been videotaped on regular schedules, with all being videotaped on testing occasions at the beginning and end of the second year and at the beginning of the third year. These children demonstrate long periods of attention at the computer. Children with behavior problems and those who do not talk to adults tend to exhibit fewer negative behaviors during computer time.

Studies we conducted (Hutinger, 1987b; Hutinger & Ward, 1988) indicate that preschool-aged children with disabilities can learn to use technology successfully when presented with the curricular approach provided by ACTT. In one study, 65 of 68 children had enough skill on the computer to insert the disk into the disk drive to start a program. Sixty could perform the operations needed to start the computer; put the disk in, shut the drive door, turn on the monitor, and turn on the computer. When we started ACTT we were not sure whether young children with disabilities could even use the equipment. We have found, overwhelmingly, that they can. When we compared four ACTT classrooms that had been involved with computers for five months (no ACTT child had previous computer experience) to a classroom without computer intervention, we found that the ACTT classrooms performed better ($p<.01$) than the control classroom. When we compared children who had computer experience to those who did not, we found that they performed significantly better on computer knowledge and use than the control group ($p<.01$). Computer knowledge included naming parts of a computer, identifying command-l keys, and using the command keys to direct a "turtle" through a maze on the monitor.

Individual children also exhibit changes as they work with computers. For example, a shy 3-year-old who preferred to help a peer physically (72.41% times per session) began to use language more in helping a peer during computer sessions (from 17.24% times in February to 71.43% in May). She also began to call attention to her own performance in May, something she rarely did earlier. Over a four month period another child became less distracted while a peer worked with him on the computer and began to focus on what the peer was doing. This child, who exhibited some serious behavior problems, began to express enthusiasm for himself or a peer (32% of the time during a session) in May.

Our videotapes show that the preschool sample can use the rather complex computer language LOGO to '"program" or "teach" the computer. Data for 30 randomly-chosen children from the 68 preschool children participating in ACTT, 15 who were beginning their second or third year of computer use and 15 in their first year of computer use, are shown in Table 4.

A series of six mazes (see Figure 1) on the computer monitor was presented to children in both groups after they had been on summer vacation and had not used LOGO for the first three months of the

Table 4: Maze Performance on ACTT Computer Test by 30 Preschool Children with Disabilities

ID#	Chronological Age	Disabling Condition	Years in ACTT	Maze 1	Maze 2	Maze 3	Maze 4	Maze 5a	Maze 5b	Maze 5c	Maze 5d	Maze 6
553	3.3	BD	1	X	0							
748	3.11	BD	1	0	0							
745	4.0	BD	1	X	0							
746	4.1	BD	1	X	0							
674	4.2	DD	1	X	X	0						
1018	4.3	BD	1	X	0							
670	4.3	DD	1	X	0							
555	4.3	BD	1	X	0							
673	4.4	DD	1	0	0							
675	4.5	DD	1	0	0							
1014	4.5	SL	1	X	0							
747	4.8	BD	1	0	0							
749	4.9	LD	1	X	0							
677	4.10	DD	1	X	0							
676	4.10	DD	1	X	0							

Maze Test Results: First Year Participants

ID#	Chronological Age	Disabling Condition	Years in ACTT	Maze 1	Maze 2	Maze 3	Maze 4	Maze 5a	Maze 5b	Maze 5c	Maze 5d	Maze 6
728	4.3	SL	2	X	X	X	X	X	X	X	0	
545	4.4	EH	2	X	0							
546	4.5	EH	2	X	0							
1011	4.6	DD	2	X	X	0						
655	4.8	DD	2	X	X	X	X	X	X	X	X	X
663	4.8	DD	2	X	X	X	0					
731	4.8	SL	2	X	X	0	X	X	X	X	X	X
662	4.11	DD	2	X	X	X	0	X	X	X	X	0
725	5.0	LD	2	X	X	X	X	X	X	X	X	X
632	5.1	SL	3	X	X	X	X	X	X	X	X	X
651	5.3	SL	2	X	X	X	X	X	X	X	X	X
718	5.3	SL	2	X	X	X	X	X	X	X	X	X
1004	5.5	EmD	2	X	X	X	0					
665	5.6	SL	2	X	X	X	X	X	X	X	X	X
538	6.10	PH	3	X	X	X	X	0				

Maze Test Results: Second and Third Year Participants

X = Correct completion of maze

0 = Attempted maze but incorrectly completed

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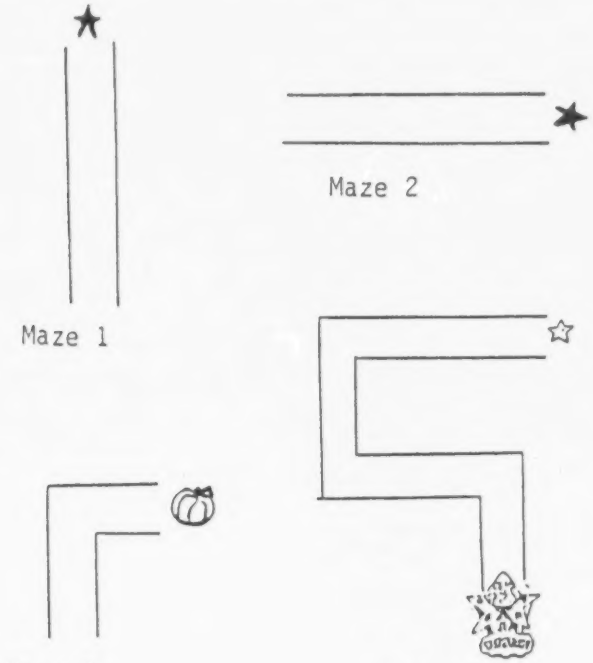
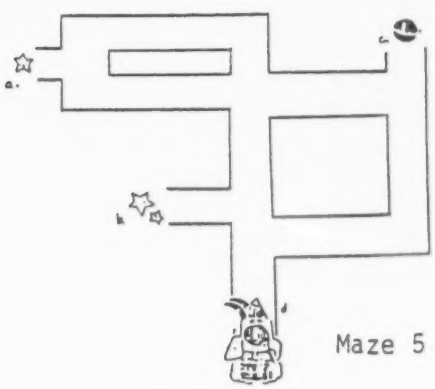
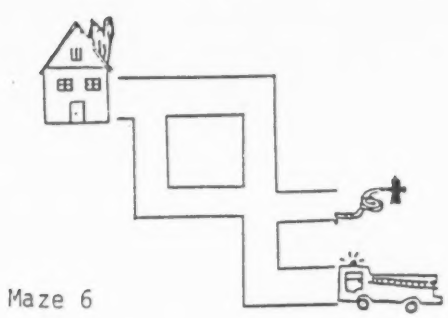
Figure 1: Maze Descriptions from Logo Test

Below are illustrations of the mazes used and descriptions of the task presented to the child by the test examiner. Mazes increase in difficulty and in number of commands necessary to complete the task. The specific sequential order was given for Mazes 4 and 6 and should be noted.







Maze 1: The child is presented a vertical tunnel with the targeted goal at the top. The turtle is located at the bottom of the tunnel. One command, FORWARD, is used to move the turtle to the goal. Each time the child presses the key representing FORWARD, the turtle moves ten turtle steps or units. The child repeats the FORWARD command until the turtle reaches the goal.

Maze 2: The child is presented a horizontal tunnel with the targeted goal at the right end. The turtle is located at the left end of the tunnel. Two commands are used: RIGHT or LEFT (preferably RIGHT) to rotate the turtle and FORWARD. The child must rotate the turtle to face the direction of the goal and move the turtle FORWARD to the goal.

Maze 3: The child is presented a three-step (three command) maze. The target is located at the upper right of the dog-leg maze. The turtle is located at the lower end of the tunnel. The desired outcome is for the child to use FORWARD, rotate the turtle RIGHT or LEFT (preferably RIGHT) and FORWARD again.

Maze 4: The child is presented a complex maze which measures the use of four commands: FORWARD, RIGHT, LEFT, and BACK. The child is asked to follow a specific sequence prior to doing the task. The examiner asks the child to help the spaceman whose ship ran out of fuel. The examiner asks the child to send the turtle as a helper. The child is asked to pick up the spaceman and take him home to his star at the end of the tunnel. The desired outcome is for the child to move BACK, FORWARD, LEFT, FORWARD, RIGHT, FORWARD, RIGHT, FORWARD.

Maze 5: The child is presented a complex maze that includes four targeted goals. The child is asked to move the turtle to each of the goals but must name the target before the execution of the task. Pre-planning skills, strategies (moving to a target over the shortest distance through the maze) and use of appropriate commands are demonstrated.

Maze 6: The child is presented a complex maze and a set of sequential directions prior to completing the task. Three goals are to be met. First, the child must move the turtle from the center intersection to the fire truck. Next, the child guides the turtle to the intersection near the hydrant and backs up the turtle as if to load the forgotten hose in the back of the truck. Finally, the child directs the turtle to the burning house to put out the fire. Pre-planning skills, following a sequence of directions and utilizing appropriate commands are demonstrated.

school year. The mazes went from a simple one to complex mazes requiring several steps. Children had three trials on each maze.

Mazes 4 - 6 were complex mazes. Sixty percent of the second and third year participants were able to complete the complex mazes using the appropriate LOGO commands to direct the LOGO turtle through defined mazes to a predetermined goal. Forty-six percent of these children completed every maze present. Those who completed mazes 3 through 6 demonstrated a high retention of LOGO skills over a 6 month period. Mazes 4 and 6 were completed in a specific sequential order as directed by the test examiner. Only one (6%) of the first year participants completed maze 2, a 2 step (2 command) maze. Children completing Maze 2 with accuracy were presented with Maze 3. Accurate completion of a maze resulted in the presentation of a more complex maze. First year participants were not presented complex mazes 4 through 6 because they could not accurately complete the first three mazes.

When we examined the differences in maze completion between the two groups of 4-year-olds, we found that while 76% of first year children could do Maze 1, only one (6%) could do the second maze. Ninety-three percent of the first year computer users could not do the second maze. But 4 year-olds who were in their second year of computer use retained skills over the summer. All could do the first maze, 75% could do Maze 2, 50% could do Maze 3, 38% could do Maze 4, and 50% could do Maze 5. Thirty-eight percent could do all the mazes. It took the children about 20 minutes to complete the mazes, so attention was a factor. Maze completion is also an indicator of time on task.

Perry, Ward & Hutinger (1987), in an effort to demonstrate the nature of child progress over time, measured the impact of weekly microcomputer interventions with preschool-aged children with disabilities over a six month period. Using a pre- and post-test design, the study focused on children's knowledge of LOGO and the ability to apply this knowledge in problem-solving situations. The ACTT children showed significant improvement on a number of effects including maze performance, $F(1,34) = 27.121$, $p < .001$, one way to measure problem solving. These results were repeated in 1989-90 with a group of 115 at risk preschoolers in the PACT/ACTT Partnership[6] Head Start project.

Severe Disabilities

Children with severe and multiple disabilities have been participating in ACTT since its inception. Two children with cerebral palsy are severely involved, and one of them is blind, the other vision impaired. These children have been regularly videotaped since they started using computers. They have progressed from sporadically using a switch to activate a computer program, to using two switches with intent to using a communication program to make choices during eating and to control two different events (i.e., a mechanical toy or sounds). They can now use various alternative inputs including the PowerPad, and can find parts of programs they wish to listen or see, and display preferences for certain sounds or visuals. The parents of these children have purchased a computer for use at home and, through ACTT efforts, the West Central

[6]Adapting A Computer Curriculum to Head Start, PR # 90CD0722, was a project funded through the Department of Health and Human Services

Illinois Special Education Cooperative bought a computer for use in their classroom. The mother has acquired skills necessary to conduct computer activities with the children.

We know that technology assists children to operate in normalized settings. A child severely involved with cerebral palsy who was served by ACTT for three years before he was transitioned into a regular first grade classroom has continued in mainstreamed settings. At age three he was adept at controlling a robot around his classroom via computer input. This child, who is now 13, still confined to a wheelchair and in seventh grade in a rural school, cannot hold a pencil and cannot see a typewriter to produce letters. However, he can use the computer for word processing, math, other content area learning, and equalized play (computer games with peers). He learned, with considerable help, to put a disk into a disk drive. His parents both have been involved with computer sessions and have acquired computer skills through participation in ACTT. We participate in his IEP staffings and, together with his mother, have been instrumental in ensuring that technology goals are written into his IEP. Last summer he told us that he wanted to use a switch for faster input since he was too slow with the keyboard. He also told us, "On Fridays I go down to the handicapped room and help them with computers. They need it." He recently told his mother that he hoped someday to have a job in computer technology.

He is but one example. Four-year old Jenna uses a LightTalker to communicate with other children at Sunday School and in other settings. Matt can play turn-taking games with other children with the appropriate software and peripherals. There are many others!

Project Impact

To date, 6,568 children are served in ACTT replication sites while 573 professionals and family members, who work with over 8,398 children, have been trained to use elements of ACTT. A summary of ACTT's services over the past three years is shown in Table 3, listing the location (international, national, other states, and Illinois) and numbers who attended training, presentations and workshops given, articles published about ACTT, and products distributed. Of particular interest is the fact that 22 of 38 sites (62%) report that they have trained others to use technology based on the ACTT philosophy. One site has become a technology resource center while another has hired a technology coordinator. Sites have adapted ACTT's observation instrument, the Behavior Interaction Tool (BIT), for their own use. At national conferences we are proud to note that other sessions focusing on technology use for children with disabilities are given by presenters who received their original technology training from an ACTT week-long training session or an ACTT workshop. The LEKOTEK staff who began COMPUPLAY based on our training resources was trained by Project ACTT. Staff members from BOCES 2 in Centereach, NY developed a software program for the Muppet Learning Keys after learning about the device during ACTT training. Signal Centers in Chattanooga, TN, an ACTT site which began in 1987, opened an Assistive Device Center in 1991. We are pleased that those who receive ACTT training are

building on ACTT's groundwork and spreading the word to others about the benefits and applications of technology for young children with disabilities.

Table 5, **Indicators of Impact,** provides a summary and comparison of selected activities over two time periods. Numbers of persons receiving ACTT materials during conference participation has grown almost tenfold, the number of replication sites has doubled, and the number of children served at the replication sites has grown by 3,477. Requests for training have also increased by 141 while the number of children served by those we have trained has gone from almost 5,700 to 8,400.

Impact on Children

ACTT produces positive changes in children. Examples of effectiveness data are shown in the previous section entitled **Evaluation Findings**. We have followed many children since they began using technology adaptations, successfully competing for a research project[7] on the basis of the data we have collected on ACTT children and the need to continue data collection on selected children. We are interested not in increasing intelligence test scores, but in helping infants, toddlers, and young children with disabilities successfully establish a sense of control over the environment, as well as a reason to persist in attempts to do so, enhance autonomy and communication. Twelve youngsters with mild and moderate disabilities in five Hawaii Birth to Three ACTT sites were observed using the computer. Their behaviors were recorded using categories on our BIT (Behavior Interaction Tool) Checklist at the beginning of a year and six months later. Significant changes in behavior at the .05 level occurred in six behaviors including demonstrating planning abilities while at the computer, a positive computer approach, independent computer use, simple cause and effect relationships between the keyboard and the monitor, appropriate behaviors, and obtaining attention from adults in socially acceptable ways (a gain that could easily be attributed to participation in other early intervention activities, not technology activities alone).

Using technology devices as learning tools has important curricular implications for birth through 2 programs established through Part H of IDEA as well as the early childhood components of Part B. A series of observations over time made with ACTT's "Computer Intervention Planning Form" over an 8 month period in our Kauai site, demonstrate that a hearing impaired youngster who was 2 years 11 months on the first observation, showed more complex behaviors during her computer time. She was receptive to software programs, and in the first observation worked on "same" and "different" concepts. During the sessions, she increasingly used appropriate signs, requested computer activities, and became interested in using the printer for hard copy. During the last observed session, she teased the clinician by pressing the switch on purpose for the wrong matching shapes, then shaking her head "no-no."

A single, but representative, example of the effects of ACTT intervention on youngsters with severe disabilities is the unsuspected and surprising verbalization of a child with cerebral palsy, cortically blind since birth. During a computer session involving a communication program using a speech synthesizer, Timmy

[7]"Effective Use of Technology to Meet Educational Goals of Children with Disabilities" is funded by the Technology, Educational Media, and Materials for Individuals with Disabilities Program

Table 5: ACTT Indicators of Impact
October 1986 - September 1992

	Oct. 1986-Sep. 1989	Oct. 1989-Sept. 1992	Total
Awareness			
• Number of persons receiving materials via conference attendance and participation	2,310	2,789	5,099
• Number of persons requesting awareness materials or information by phone/letter	403	1180	1,583
Stimulating High Quality Programs			
• Number of children served at three continuation sites	110	203	313
• Number of replication sites	33	34	67
• Number of professionals trained on model	86	152	238
• Number of children served at replication sites	3,091	3,477	6,568
Product Development/Distribution			
• Number of products distributed*	1,431	1,389	2,820
• Number of edited videotapes available	7	12	19
• Number of viewers	3,470	4,194	7,664
• Number of children served by those receiving project materials	93,200+	100,590+	193,790+
Training			
• Requests for training received	128	269	397
• Number of workshops conducted	26	38	64
• Number of professionals receiving training	397	573	970
• Number of children with disabilities served by number of persons receiving training	5,695+	8,398+	14,093+
Other Technical Assistance Consultation			
• Number of children served with increased high quality services	2,090+	3,745+	5,835+
• Number of persons receiving information on purchasing equipment	108	261	369

pressed the switch to signal that he wanted to drink. Then he pressed "eat." Immediately after he heard the synthesizer say "eat," Timmy uttered the word "cookie" for the first time, surprising an ACTT staff member. The attending pediatrician during Timmy's initial hospital stay told the parents that he would never be able to recognize his mother. When he was eight, we heard him tell his mother, "I love you." While we cannot take full credit for his development, access to the computer over time has provided Timmy with a sense of autonomy and a means of expression. His parents are convinced that it has been and will continue to be a useful tool. Ongoing videotapes of this child over time show changes in behavior and provide a wealth of anecdotal data regarding the effectiveness of computer use.

Impact on Staff

ACTT replication, training, and product development add a new and state-of-the-art curricular element to early intervention programs that improves the experiences offered to children and families by providing access to technology applications previously inaccessible to them. Early intervention staff report that, through ACTT, staff are discovering skills that were hidden in children; that children open up to the computer; that computer use has expanded treatment options; that parents respond positively to computer use; and that it provides another modality to use in intervention services. One response said, "Parents love it and children enjoy it!" Another site survey response indicated that use of technology via ACTT "enhanced credibility with the school system and professionals," and that it "enhanced visibility in the community."

Early intervention staff report a variety of gains. Survey responses regarding outcomes indicate the following. "Confidence in using the computer for our entire staff;" "A great base of training for computer and ways to integrate it into the curriculum;" "Awareness of the variety of technology available to meet the needs of special needs children;" "Types of adaptive equipment available to use with special needs kids;" "Ability to transfer the skills we have learned to others;" "Satisfaction of knowing that we are able to help children through technology."

We have collected data showing that adults have gone from no skill or knowledge of computers to becoming computer users with varying degrees of competence. These skills, documented by computer competencies records kept since ACTT' s inception, show that teachers now can assemble equipment, operate equipment, run a variety of software, plan activities and carry out and evaluate computer activities. For example, data was collected at one site with questionnaires at regular intervals from four teachers in preschool classrooms and a teacher in the severe and profound classroom on their perceptions of ACTT effects on the children as well as their attitudes and computer competencies. This data shows uniformly favorable perceptions of children's use of computers. Staff strongly agree that the computer is a valuable learning tool and one good way of learning about problem solving, autonomy and environmental control. They agree that computer use contributes to the children's ability to have more control over their environment and that children become better risk takers and more willing to solve their own problems. Further they agree that computer use contributes to

social skills. They strongly agree that children have increased attention span when they use the computer and that the increase continues even when computer use is no longer a novelty.

The teachers have all acquired computers for regular use in their classrooms and sit on computer committees in their schools. One teacher has responsibilities for ordering software. The teacher in the classroom for children with severe disabilities has moved from possessing no skills on the computer to "programming" the Adaptive Firmware Card for specific uses, a complex technical skill. The majority of teachers also use the computer as a tool for themselves also for keeping class records and inventories, maintaining budgets, creating newsletters and calendars, and corresponding with families. Most of those who value the computer for these uses have purchased a computer for use at home.

Impact on Families

Parents, involved in ACTT at three different levels (information, assistance in intervention, and actually doing computer intervention), report uniform satisfaction with ACTT services. Questionnaire data has been collected at regular intervals from parents in all three components. Parents of birth to 3 children are pleased with ACTT intervention, and believe that it may have lasting effects on the child. Parents in the preschool classrooms are all convinced that working with computers will be of great benefit to their children. All of the parents of children with disabilities feel that computers will make a big change in their children's lives in areas of communication and accessing the environment. Five of the parents in the Birth to Three component and the Severe and Profound component at one site moved from possessing absolutely no computer skills to being competent computer users and conducting intervention through instruction from the ACTT team. Others have made similar gains.

Parents report the importance of technology to their children. In a recent interview, one mother said, "I think we all feel that it is going to be a necessary part of her and our lives. Since she's so limited motorically, we'll have to use technology to access and to increase the cognitive level. . . I think as a parent of a severely handicapped child that anything positive in the computer or anything else is a wonderful expectation for a parent. Because there are very few positives . . . ." The mother of another child said, when asked about her child's use of technology, "I think it is good. I think it is very good. I think it is good for all children, but especially M., in particular, because he loves the computer. . ."

Twenty parents in a Hawaii site whose children had been involved with ACTT for six months to a year, reported in January, 1991, that computer activities were helpful to them and their child (75%). They indicated that they had gained knowledge of how the computer works (70%); knowledge of how the computer could help their child (75%); knowledge of computer activities for their child (90%); a better understanding of what their child could do (65%); and skills for working with their child (45%). When asked whether they thought their child's involvement with ACTT computer activities would change their child's opportunities for schooling or a fuller participation in life, 80% answered "yes." These results are representative of results from parents during our model demonstration years.

Access to technology also improves family participation in programs and renews adult interest. ACTT provides a practical and effective way to integrate children with disabilities into mainstream environments and to normalize the experiences of those children. When young children with disabilities can use computer technology and ACTT applications, they have opportunities to equalize play, to communicate, to draw, to interact, and to participate in early childhood settings in meaningful and functional ways. Aspects of computer use lead to optimal functioning levels within normalized and nonsegregated environments.

Impact on ACTT Staff

ACTT staff have remained on the cutting edge of technology applications for young children with disabilities and are recognized as leaders in the field. Those who have been with the Project since it began as a model demonstration project in the early 1980's have grown up with technology and have made a commitment to the Project's philosophy and goals. To maintain their positions as leaders in the field, staff keep abreast of the latest developments in software, hardware, and peripherals. They train themselves on the use of the equipment and ways to make adaptations so they can in turn teach others. Staff have become interested inthe use of multimedia and have developed multimedia presentations and applications. They have been involved in the production of videodiscs and a CD-ROM for assessment training.

As more people discover the advantages of technology for young children with disabilities, staff is in greater demand for national and regional workshops, training sessions, conference presentations, and telephone consultations. Time is spent in service to others as resources. Staff serve as consultants on a national level and at a state level work hand-in-hand with the Illinois Assistive Technology Project, providing workshops, resource materials, training on assistive technology for young children. At a local level, one staff member serves on the computer committee for the local school board. Others, at the request of teachers and parents, attend IEP meetings and staffings to advise on a child's use of assistive technology.

Staff members have computers at home -- many have more than one! Not only are these computers used for home recordkeeping, correspondence, and staff members' children's use, but staff also use their computers to do Project work at home, creating adaptations or working on a troubleshooting tip in their "spare time."

Impact on Other Projects

Project ACTT's philosophy and practices have served as the basis for six other national technology-related projects funded through the United States Department of Education and the Department of Health and Human Services.

The Mico Applications Project, 1986 - 1989, was funded to provide technology training via videotape. At least 15 videotaped training modules, varying in length from 15 to 30 minutes, and accompanying manuals were created for distribution. Topics included communication, Logo, switch making, understanding computer

basics, and family involvement. Videotapes targeted the birth to three, three to five, and severe disabilities populations.

The PACT-ACTT Partnership Project, Adapting a Computer Curriculum to Head Start, began in 1989 and ended in 1991. The ACTT Computer Curriculum was used in the Head Start programs in Springfield and Jacksonville, IL. Teachers as well as interested parents were trained to use computers in the Head Start curriculum. Children with behavior disorders, language delays, and learning disabilities received computer intervention.

The Technology Team Assessment Project (TTAP), 1989-1992, was created from the technology assessment component of ACTT and based on the philosophy that technology cannot benefit a particular child unless correct adaptations and activities are identified and used. The technology asssessment using a team approach (parents, therapists, teachers, and other professionals) was designed to meet the technology needs of each individual child.

The Technology Inservice Project (TIP) began in 1991. TIP provides inservices to teachers, parents, and other professionals in Illinois sites on all aspects of technology applications for young children with disabilities. The second component of TIP focuses on applications for adult productivity using technology.

In 1991 Project CAPSULe began providing technology interventions to children in the Springfield Urban League Head Start sites in Springfield and Jacksonville, IL. Assistive technology interventions and adaptations are used with a select group of children with disabilities. Training is provided to parents, teachers, and support staff so they can continue technology use when the Project ends.

A qualitative research project began in 1991. Effective Use of Technology to Meet Educational Goals of Children with Disabilities is collecting data and writing case studies of children who have been using technology for a number of years (children who were three and four years old and part of ACTT's model demonstration phase in the 1980"s) and of children who are relative new technology users (those who were assessed recently by Project TTAP). The purpose of the project is to find benefits and barriers to technology use.

Products

A number of products have been developed to help others use the ACTT Model. These include the eight training modules; **Building ACTTive Futures: ACTT's Curriculum Guide for Young Children and Technology**; **How To's for Apple IIs**, a guide to using Apple II peripherals; **Good Leads for Software Needs**, a guide to early childhood software; **A Switch To Turn Kids On**, a switch construction manual; videotapes (an overview and specialized tapes showing various computer applications); and software, such as the **CORE** (Computer Oriented Record Keeping Enabler) which can be used as a framework to plan and customize individual activities for very young children with disabilities; **Master Blaster**, a switch game for two players designed to reinforce audio and/or visual attending; **Switch 'N See**, record-keeping software designed for the cognitively young child to reinforce cause and effect relationship to a switch press. Our products are updated

regularly to keep them current according to the developments in the computer marketplace. ACTT also distributes a twenty-page quarterly publication, **ACTTion News**, which contains current technology information, software reviews, and other news of interest to those we serve.

Future Activities

Project ACTT will be able to continue its work with young children and technology. Our Outreach proposal was funded and, on October 1, 1992, we began the first year of a new Outreach cycle. We continue to offer our services for workshops, presentations, replication training and follow-up. Outreach efforts now include coordination with NEC*TAS for providing replication training to meet States' needs. Once again, we will host an annual technology conference. New products focusing on the Macintosh LC are under development, as is software for the IIGS and Macintosh LC. Plans for the new Outreach activities also include hosting interactive satellite television programs and developing a laserdisc showing child applications using technology. We are firm believers in the benefits technology has to offer young children with disabilities and are looking forward to sharing our knowledge with others who are only now coming to recognize the positive impacts technology can have on the lives of children.

Assurance Statement

One copy of this full final report has been sent to ERIC. Copies of the title page and abstract from this final report have also been sent to NEC*TAS, the National Clearinghouse for Professions in Special Education, NICHCY, the Technical Assistance for Parent Programs Project, the National Diffusion Network, the Child and Adolescent Service System Program, the Northeast Regional Resource Center, the MidSouth Regional Resource Center, the South Atlantic Regional Resource Center, the Great Lakes Area Regional Resource Center, the Mountain Plains Regional Resource Center, the Western Regional Resource Center, and the Federal Regional Resource Center.

Further information about Project ACTT, its procedures and products can be obtained by writing Dr. Patricia L. Hutinger, Director, Macomb Projects, 27 Horrabin Hall, College of Education, Western Illinois University, Macomb, IL 61455.

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